# ARDEC: PROVIDING DECISIVE LETHALITY FOR THE ARMY'S GO-TO-WAR WEAPONS

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## Introduction

Situated on a 6,500-acre military installation located in the northwest corner of New Jersey, the Picatinny Armament Research, Development and Engineering Center (ARDEC) plays a unique role in the United States' ability to wage war. There is no other comprehensive armaments facility like it in the country; it is a one-of-a-kind facility that provides virtually all of the lethal mechanisms used in Army weapon systems.

Through the years, Picatinny's major developments in manufacturing and technology have reduced dependence on foreign sources and provided greater accuracy and lethality to a range of weapons. During World War II, it was the only facility in the United States producing ammunition larger than 50 caliber.

While some applied research in explosives, propellants, and pyrotechnics was conducted, funding for overall research and development was almost nonexistent during the first half of the century. This all changed in the years following World War II when Picatinny was given a leadership role in the research, development, engineering, and production support for advanced weapon systems. From fuzes, propellants, fire control systems, and energetics to the lethal power of mortars, tanks, and artillery, Picatinny manages the process from birth to battlefield.

## Matching Munitions To The Mission

At the same time that air strikes and cruise missiles were launched in Operation Iraqi Freedom, U.S. Army ground forces were advancing to take control of cities throughout Iraq. Our forces not only had to take the ground, they also had to hold it and, eventually, secure those areas. U.S. policy focused on striking only legitimate military targets and made every effort to protect innocent civilians. The array of warheads, projectiles, cartridges, fuzes,


***A soldier affixes a fuze in the field. Picatinny engineers, scientists, and technicians developed many of the techniques used to design fuzes.***

armament systems, and nonlethal munitions developed and fielded by the people at Picatinny provided field commanders with the flexibility they needed to match the munition to the mission.

Picatinny has high regard for the men and women who use its armament systems and makes a special effort to incorporate their input into weapon designs and upgrades to achieve the highest levels of reliability. Recently, soldiers from the Army's 10th Mountain Division, who fought in Afghanistan during the early stages of U.S. efforts to topple the Taliban, were invited to Picatinny to tell program managers what needed improvement. This interaction between battle-tested soldiers and Picatinny scientists and engineers resulted in superior products tailored to the needs of those who use them on the battlefield. Even now, several Picatinny representatives are in the Iraqi theater monitoring weapon performance.

## Performance In Iraq

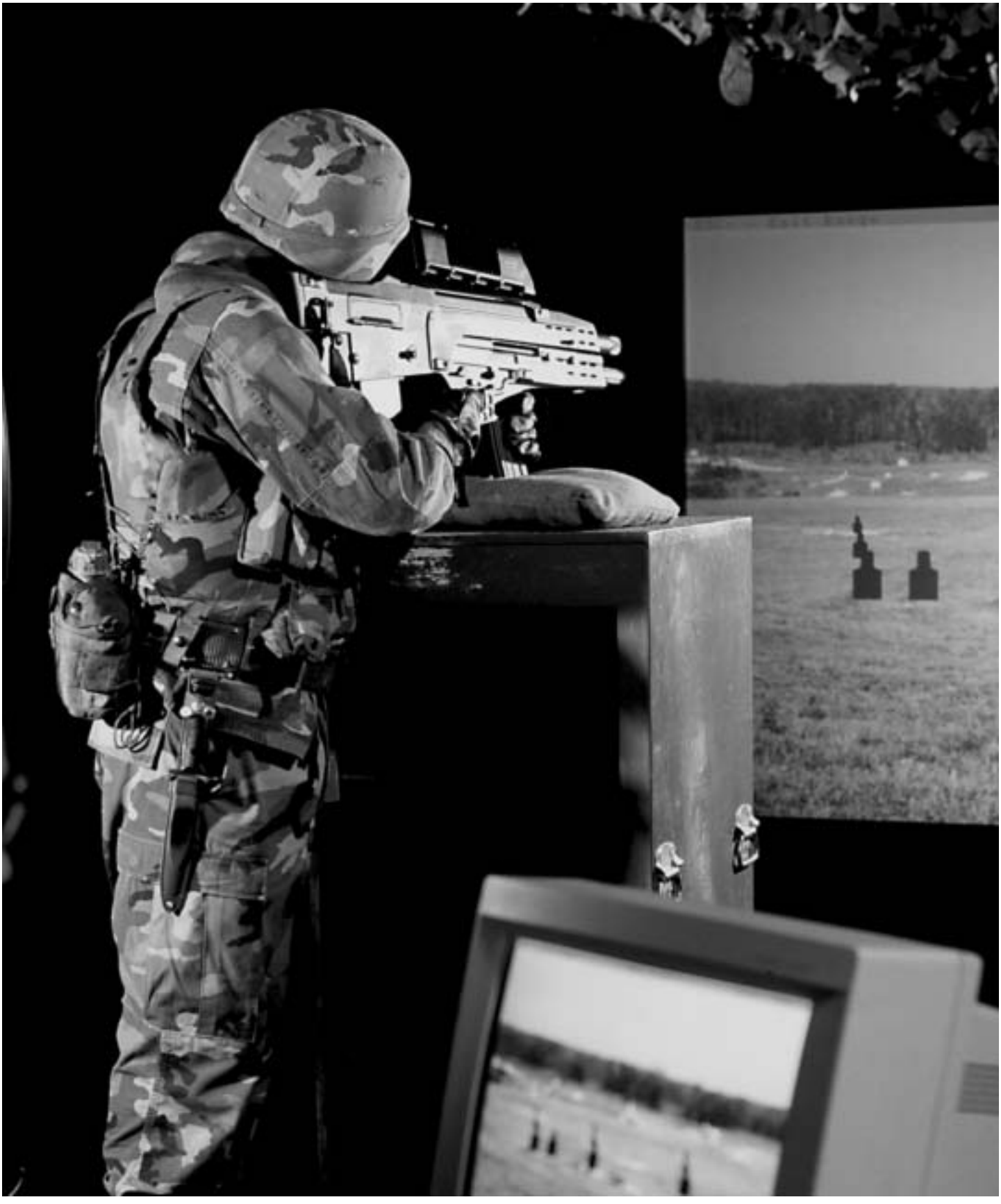
The 25mm M919 cartridge, an armor-piercing, fin-stabilized round with a discarding sabot and tracer, has been one of the stellar performers during Operation Iraqi Freedom. Used for the first time in actual combat, the M919 represents the state-of-the-art in 25mm armor-piercing ammunition for the Bradley Fighting Vehicle. It combines higher energetic propellants and a low-drag profile depleted uranium penetrator core to deliver greater lethality and survivability to our troops. Feedback from the field has been extremely enthusiastic. Initial after action reports from the 3rd Infantry Division and the 3rd Squadron of the Army's 7th Cavalry Regiment indicate that this round has been used successfully against BMPs (Russian-made vehicles) and T-72 tanks, as well as against other lightly armored targets. From all indications, the M919 cartridge has met or exceeded expectations for trace visibility, round-by-round accuracy, and lethality, providing our soldiers with the best possible armaments.

The Paladin 155mm Self-Propelled Artillery System again proved its military value during the Iraqi war. Paladin, fielded just after Operation Desert Storm, can fire a round 30 seconds after stopping, compared to the several minutes required by older self-propelled artillery systems. This greater mobility and firepower significantly increases platform survivability. At any given time during Operation Iraqi Freedom, all three artillery battalions were able to provide responsive, devastating fires at ranges out to 30 kilometers.

The M141 Shoulder-Launched Multipurpose Assault Weapon-Disposable Bunker Defeat Munition (BDM) also proved to be extremely effective, particularly in the urban environments of the Middle East. This shoulder-fired weapon system was designed to defeat earth and timber bunkers, breach masonry walls, and destroy caves with a single shot. During Operation Enduring Freedom, U.S. Forces used the BDM to turn Al Qaeda hideouts into rubble. In close combat situations within cities and outlying areas of Iraq, it has performed equally well.

Other Picatinny-developed weapon systems include ammunition for the 120mm main gun on the Abrams tank, which was widely used in both the Gulf War and Iraq. In the Gulf War, Abrams tank crews engaged large numbers of Iraqi tanks. Here, the kinetic energy long-rod penetrator overwhelmingly defeated the most advanced heavily armored threats. In Iraq, as the emphasis shifted to urban targets (i.e., buildings, bunkers, and dug-in vehicles), Picatinny's 120mm Multi-Purpose Anti-Tank round, which was designed specifically to counter urban targets as well as enemy helicopters, easily achieved its objective by completely destroying the intended targets.

***The Paladin uses an onboard computer system to receive fire missions, compare firing data, select and take up firing positions, automatically unlock and point its cannon, and then fire.***



*The ARDEC simulator has high-tech capabilities including an infrared spot tracker and two computers for data acquisition and control.*

## Nonlethal Weapons

A variety of nonlethal capabilities have been developed under Picatinny's purview. Nonlethal weapons are important because they expand the options available to commanders in situations where the use of deadly force is not the preferred response. Nonlethal munitions developed and fielded by Picatinny have been used with great effect in Kosovo and were recently made available for potential use in Afghanistan and Iraq. The 40mm nonlethal cartridge, or Sponge Grenade, is a prime example. This blunt impact munition can be point-fired from a standard rifle-mounted grenade launcher against belligerent noncombatants and has proved to be enough to halt the threat. However, should it not stop the threat, the soldier can immediately resort to lethal force with his rifle's 5.56mm ammunition. In this way, the field commander is provided with a range of force response options to effectively conduct the mission.

A device called the Portable Vehicle Arresting Barrier is available for use at checkpoints and other high-security locations to stop wheeled vehicles. It employs nylon webbing that can trap a 14,000-pound vehicle doing 35 mph like a fly in a spider's web without fatalities or serious injury to the vehicle's occupants. Another munition, the Modular Crowd Control Munition (MCCM), a nonlethal variant of the Claymore mine, delivers a payload of 600 rubber balls. It provides crowd control and force protection by deterring hostile groups of noncombatants and is another alternative to lethal force options.

With an ever-widening role in the development of nonlethal systems—whether for use on the battlefield or in peacekeeping missions—Picatinny is currently working on a nonlethal mortar projectile that will permit commanders to use indirect-fire systems to deny areas to large numbers of hostile noncombatants, including those found in urban environments. This poses a unique challenge considering that the objective is to create a payload delivery mechanism that will minimize collateral damage.

Developers say that the ultimate weapon will be truly "scalable" or tunable to the level of force needed, a trait that will allow field commanders to decide whether nonlethal or lethal force is needed to deal with the threat.

## Streamlining Development

Picatinny's mission is to support Army transformation goals. In an effort to streamline the acquisition process and deliver the armaments that soldiers need exactly when they need them—and at an affordable price—Picatinny has established increasingly close partnerships with universities and industry partners, involving them in collaborative efforts early in the research and development process.

Picatinny uses unique laboratories and special facilities to evaluate prototype designs, thus reducing development cycle time. These facilities are also available to Picatinny's contractors and other government agencies that are part of the national energetic consortium established by Picatinny and the Army Research Laboratory.

For example, Picatinny's state-of-the-art integrated digital modeling and simulation suite facilitates collaborative efforts among engineers, scientists, testers, users, and maintainers. It allows product concepts to be evaluated for warfighting value and manufacturability in a virtual environment that brings every partner into the process. The gains in speed-to-market and reduced testing costs are already an essential ingredient in the plans of the Future Combat Systems Lethality Program.

## Conclusion

What will the battle of the future look like? It will differ greatly from today's battles, with computers and communications dominating its shape. However, it will continue to remain an exercise of lethal effects. Whether massed fire, networked fire, precision strike, or joint strike, future battles will continue to ultimately depend on the combatants' ability to do damage. No other organization in the world can provide this capability as well as ARDEC. Picatinny has proved its expertise in developing the kind of weapons that will keep the U.S. Army the most dominant fighting force in the world. As New Jersey Governor James E. McGreevy recently said, "Never has Picatinny's mission been so clear, or its contribution as valuable."

***The MCCM is a nonlethal variant of the Claymore mine. Its ability to incapacitate large, hostile groups gives the battlefield commander the option to apply nonlethal force as a first line of defense where appropriate.***

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